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Exploration of Digital Transformation Technologies in South Korea through Startup and Scale-up Ecosystem Analysis

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Exploration of Digital Transformation Technologies in South Korea through Startup and Scale-up Ecosystem Analysis

Abstract

This study delves into the contemporary phenomenon of the convergence of digital technology and the service industry, aiming to provide a profound analysis and propose future-oriented directions for industrial development. It seeks to offer academic insights and practical guidelines through this exploration. The necessity of the research stems from the significant impact of digital technology in today's society, which is reshaping traditional service industry landscapes and prompting innovations in service delivery. Understanding these technological shifts is crucial for formulating effective industrial strategies and policies. This era of Digital Transformation (DT) reflects a transition from vertically integrated firms to disaggregated supply chains, highlighting the evolution of business competition into a fusion on digital platforms. The research aims to develop a new analytical framework to view the digital transformation process in the service industry, thereby innovating research and practical approaches in this field. A focus on innovative startups driving digital transformation is employed, with in-depth analyses using topic modeling and network analysis to understand their impact on the service industry. The study also investigates the fusion and trends within the service industry, utilizing topic modeling to examine classification methods and analyze the convergence trends of technology and business models (BM). Furthermore, the research aims to clarify the employment impacts within the digital transformation ecosystem. By analyzing factors influencing employment changes, it

intends to provide insights into future employment trends and policy directions, preparing for the forthcoming era of advancements like artificial intelligence. This comprehensive approach not only aims to understand the current changes systematically but also to prepare for the rapidly evolving digital era's demands on the service industry.

INTRODUCTION

In the era of the Fourth Industrial Revolution, the concept of digital transformation has emerged as a pivotal keyword, heralding a new phase of integration between digital technologies and various sectors of the economy. The anticipation of significant productivity enhancements and innovations, through the fusion of traditional materials with cutting-edge information and communication technologies (ICT), artificial intelligence (AI), and big data analytics, underpins this focus. Such transformations are not merely incremental; they represent a paradigm shift, redefining the very essence of how businesses operate, create value, and compete on a global scale. This shift is inherently agnostic to the level of economic development, suggesting that its potential benefits and challenges are universally relevant.

South Korea, a nation renowned for its rapid technological advancement and digital savvy, stands at the forefront of this transformation. The question, then, is how the country's digital transformation technologies, particularly within its vibrant startup and scale-up ecosystem, are evolving and contributing to this global shift. Traditional analyses of digital transformation have predominantly leaned on patents and academic literature to track technological trends. These methods, while invaluable, offer a somewhat constrained view, focusing on discrete innovations and failing to capture the broader, more dynamic landscape of

digital transformation. They especially fall short in accounting for software, databases, and other IT services that are crucial to digital transformation but are not always encapsulated in patent filings or scholarly articles.

Recognizing these limitations, this study draws inspiration from the innovative approach of van Meeteren et al. (2022), who bypassed conventional sources in favor of analyzing technology tags used by companies. This method, which involves filtering companies based on digital transformation-related tags in global data platforms like dealroom.co, allows for a more nuanced understanding of the technology space. By examining the co-occurrence of technology tags among 40,754 startups and scale-up companies, van Meeteren et al. crafted a detailed map of the digital technology landscape, revealing patterns, trends, and the evolution of digital transformation technologies that are otherwise difficult to discern.

Adopting van Meeteren et al.'s methodology to the South Korean context, this research aims to uncover the contours of digital transformation within the country. By leveraging data from 'Innovation Forest,' a platform akin to dealroom.co but focused on South Korean ventures, this study seeks to explore the ecosystem of digital transformation ventures in Korea. The analysis of technology tags and categories from these companies will offer insights into Korea's digital technology space, highlighting how startups and scale-up companies contribute to the broader digital transformation agenda.

This introduction lays the foundation for a deeper exploration of digital transformation technologies in South Korea, focusing on the novel approach of analyzing technology tags and categories to map the technology space. In doing so, it aims to provide valuable insights into effective digital transformation strategies and policies, contributing to the ongoing discourse on

the Fourth Industrial Revolution and its implications for economies around the globe. By examining the specific context of South Korea—a leading player in the digital era—this study not only contributes to the academic understanding of digital transformation but also offers practical insights for policymakers, entrepreneurs, and scholars interested in the dynamics of technological innovation and economic growth.

METHOD

Innovation Forest (www.innoforest.co.kr) is a startup platform that analyzes the growth of startups. It provides services that provide information to investors and consumers by analyzing startups' businesses and technologies. In this study, we analyzed the ecosystem of venture companies utilizing digital transformation technology using the database provided by Innovation Forest. There are 4,709 companies in the provided DB. The 'Innovation Forest' interface allows for detailed information retrieval on companies, including finances, services, investments, etc., upon selection.

Topic Modeling: Concept and Application

Topic modeling is a statistical modeling method for discovering abstract "topics" within a collection of documents, useful for uncovering hidden thematic patterns in large text data. This study utilizes Latent Dirichlet Allocation (LDA), among various topic modeling techniques, to explore the digital transformation ecosystem's industry classification.

Industry Classification within the Digital Transformation Sector

In the process of noun extraction, initial preparation entails loading the 'tidytext' package for textual analysis within the R programming environment, accompanied by the 'KoNLP' package for processing the Korean language. The subsequent step of noun extraction and purification involves employing the `unnest_tokens` function to meticulously extract nouns from the textual content within the description column. This procedure utilizes the `extractNoun` tokenization function, with a specific exclusion criterion for single-character nouns, ensuring the extraction of meaningful lexical items.

The methodology also includes a phase of duplicate word elimination, where repeating lexical entities are systematically removed for each unique company identifier (`CORP_ID`), thereby purifying the dataset. In addressing the removal of high-frequency words, a two-step approach is adopted. Firstly, the frequency of each noun is ascertained using the `add_count` function, followed by a filtering process that retains only those nouns with a frequency threshold of 300 or less, effectively excluding excessively prevalent terms.

Further refinement is achieved through the identification and removal of stop words and the handling of synonyms. This entails a comprehensive frequency analysis and subsequent examination of the top 200 words to pinpoint stop words or synonymous terms. Data cleansing procedures are implemented, involving the replacement of identified synonyms and the uniform conversion of all lexical items to uppercase, thereby standardizing the dataset.

The creation of the Latent Dirichlet Allocation (LDA) Model commences with the formation of a Document-Term Matrix (DTM) utilizing the `cast_dtm` function. This matrix, predicated on word frequencies by document, serves as the foundation for subsequent model training. The LDA model training phase encompasses the utilization of the `FindTopicsNumber`

function to train models across a spectrum of topic numbers, ranging from 2 to 20, with the trained models being preserved for further analysis.

The determination of the optimal number of topics is a crucial aspect of the study, involving a strategic visualization of results through the FindTopicsNumber_plot. This visualization aids in ascertaining the most suitable number of topics, enhancing the model's utility and relevance. Within the domain of topic determination, the role of the researcher is pivotal, entailing the selection of an appropriate number of topics for topic modeling. This selection process is informed by the application of specific metrics, such as 'Griffiths2004', to meticulously evaluate model performance across various topic numbers. Performance evaluation is conducted with an emphasis on a metric whose value ranges between 0 and 1, serving as an indicator of the model's efficacy. Although an initial consideration of 10 topics was posited, subsequent analytical deliberations advocated for the selection of 20 topics as a means to most efficaciously group analogous companies. This methodological approach, through detailed data analysis and sophisticated topic modeling, provides a comprehensive understanding of the digital transformation trends and industry classification within the digital ecosystem.

RESULT

The application of topic modeling for industry classification yielded insightful outcomes, providing a structured overview of industries within the digital transformation ecosystem. This section details the results obtained through the analysis, focusing on the frequency of words per topic (industry), industry distinction evaluation, and the final naming of the identified industries.

1. Healthcare, Food, and Cosmetics Commerce & Technology Services Industry
2. Novel Drug Development and Digital Technology Utilization in Immune & Intractable Diseases Industry
3. Smart Manufacturing Technologies and AI Utilization in Sales & Electrical Infrastructure Industry
4. Smart Software and Location-Based Accommodation & Travel Service Brokerage Industry
5. Wearables and Pharmaceutical-Based Brand Commerce & Sales Industry
6. Online Payment, Commerce, and Autonomous Driving Technology Industry
7. Big Data Analysis & Security-Based Business Solution Industry
8. AI & IoT-Based Education and Distribution Content Systems Industry
9. Fashion, Beauty, and Health-Focused Digital Content & Information Systems Industry
10. Global Information & Data Management IT & E-commerce Consulting Industry
11. Digital-Based Online & Offline Community & Marketing Support Industry
12. Vehicle Management, Robotics Technology, Diagnostic Products Manufacturing & Media Industry
13. Meta Education, Shopping & Goods Management, English Visitation Services Industry
14. Online Sharing & Collaboration-Centric Comparison-Purchase Commerce
15. Digital E-commerce, Pet Care, IoT Manufacturing & Real Estate Brokerage Startup Industry
16. Mobile Gaming and VR Utilized Custom Media & Spatial Planning Industry

17. Remote Education & Booking Services Centered Brand Product Distribution & Software Design Industry
18. Blockchain-Based Virtual Asset Management and Integrated Trading Community Industry
19. Professional Manufacturing and Supply Through Eco-Friendly Technology Industry
20. Content Creation & Video Streaming Industry Through Various Media

These classifications underscore the intricate interplay between technological advancements and sectoral evolution within the digital transformation landscape. Each industry encapsulates a unique amalgamation of digital technologies and business models, signifying the multifaceted nature of digital transformation across various sectors.

FURTHER STUDY

Longitudinal Analysis: Tracking the evolution of the identified industries over time could provide insights into how digital transformation trends shift with technological advancements and market changes. Such studies would be invaluable in understanding the lifecycle of digital innovations and their long-term implications for various sectors.

Technological Convergence: As emerging technologies such as AI, blockchain, and IoT continue to converge, exploring their combined effects on industry innovation and disruption could provide valuable insights. Future studies might examine how these technologies foster new

business models or transform existing ones, potentially leading to the emergence of new industries.

References

- van Meeteren, M., Trincado-Munoz, F., Rubin, T. H., & Vorley, T. (2022). Rethinking the digital transformation in knowledge-intensive services: A technology space analysis. *Technological Forecasting and Social Change*, 179, 121631.
- Lee, C., & Kim, H. (2018). The evolutionary trajectory of an ICT ecosystem: A network analysis based on media users' data. *Information & Management*, 55(6), 795-805.